dehydration and increase the amount of productive photosynthetic plant tissue. Leave lawn clippings after mowing because their slow release of nitrogen favours the decomposition of thatch by microorganisms.

4. If grubs are detected during the warm, dry periods of the growing season, irrigate and fertilize your lawn to maintain the turf vigour and to compensate for the root feeding damage. Applying a top dressing of sand and manure and overseeding with grass appropriate to the area may help.

5. Deep infrequent irrigation encourages deep-rooted drought-tolerant lawns. Water no more than once per week and water until at least 2 cm (1 inch) of water collects in a container placed on your lawn or for about an hour.

6. Use fertilizer with high potassium and adequate nitrogen.

7. You can hand pick adult beetles or vacuum them using a small vacuum with a disposable bag. You can also shake beetles from plants and collect them in a cloth placed directly below the plant. For best results, collect the beetles early in the morning when they are still sluggish. You can kill the beetles by immersing them in soapy water.

8. If you can, dig or till your land one year before you want to seed it or lay sod and leave it fallow for that year.

Biological Control

1. Beneficial predatory insects, such as ants on the eggs of June bugs, and parasitic insects, such as wasps (e.g., *Tiphia vernalis* and *T. popilliavora* on the Japanese beetle, and *Tiphia intermedia*, *Pelecnus polyturator* and scoliid wasps on the June bug) and flies (e.g., *Istochaeta aldrichi* on the Japanese beetle) help keep the host populations in check. Some of these are specific to a single host, but others will control several pests in an area. You can obtain these from various insectaries throughout Canada.

2. Use companion plants such as larkspur and geraniums that may be toxic to the grubs.

3. Choose resistant varieties of plants. If reseeding or establishing a lawn, use grasses containing an endophytic fungus that repels the grubs. Unfortunately, there are currently no cultivars with endophytes in Kentucky bluegrass or the bentgrasses used commonly in cold weather areas. There are some in the fescues and ryegrasses, however, so use those mixed with other species if possible. Choose grasses that have underground (rhizomes) and aboveground (stolons) stems because these plants can regenerate themselves quickly and easily when damaged.

4. Use bird houses to attract the natural bird predators (starlings, blackbirds) that feed on white grubs.

Chemical Control

There are commercial products available to professional pest control operators and some domestic products available to homeowners. Before purchasing a pest control product, check the label to make sure that the product is registered for this use.
Some products recommend lawn watering after a chemical application against white grubs. Watering allows the product to penetrate more deeply into the soil and helps to reduce the number of grubs that have burrowed deep beneath the surface. Follow the directions on the label for your product. For all three species, apply a treatment just after the larvae have hatched in mid to late August or in mid-September when the turf is moist. As with all chemical pesticides, before you treat your lawn determine that the number of grubs is above the threshold level for that grub (about 5–10 per square foot of turf).

Some illustrations courtesy of
the Ohio State University Extension
the University of Florida
the Kansas Dept. of Agriculture, Plant Protection and Weed Control Program

Remember

Before Purchasing a Pesticide Product
- Identify the pest correctly.
- Use physical control methods and alternatives to pesticides.
- Read the label directions and safety precautions before buying the product. The label must include the name of the pest to be controlled and the treatment location (e.g., indoor, outdoor, garden uses, pet treatment).
- Purchase only the quantity of product needed for the treatment.
- Alternatively, you may choose to hire a licensed pest control operator.

When Using a Pesticide
- Carefully read all label instructions and precautions before using pesticides.
- Do not drink, eat or smoke while applying pesticides.
- Persons and pets should vacate the area during treatment. Cover or remove aquaria.
- If kitchen area is to be treated, cover or remove food, dishes and utensils.

After Handling a Pesticide
- Always wash your hands thoroughly after handling any pesticide product.
- Do not permit persons or pets to contact treated surfaces until residue has dried completely.
- Provide adequate ventilation of treated areas after use.
- Wipe clean all surfaces that comes in direct contact with food, such as counters, tables and stovetops, including indoor and outdoor surfaces.
- Always store pesticides out of reach of children and pets and away from food and beverages.

In Case of Accidental Poisoning
- Call a poison control centre immediately and seek medical attention.
- Take the pesticide container or label with you to the emergency facility or physician.
- Follow first aid statements on the label.
- In case of accidental poisoning of pets seek veterinary attention immediately.

When Disposing of Pesticides
Do not reuse empty pesticide containers. Wrap and dispose of in household garbage.

Unused or partially used pesticide products should be disposed of at provincially or municipally designated household hazardous waste disposal sites.

Use Common Sense
- These are general recommendations.
- Consult the label for specific instructions.
- When in doubt, contact a professional.

Pest Management Regulatory Agency
2250 Riverside Drive
Ottawa ON K1A 0K9

Pest Management Information Service
Telephone: 1-800-267-6315
From outside Canada: (613) 736-3799*
*Long distance charges apply.
Fax: (613) 736-3798
Internet: www.hc-sc.gc.ca/pmra-arla

Canada

Effective Control of White Grubs

Effective Control of White Grubs

June 2000

Description

White grubs are the larvae of beetles and chafers. These insects form an important group of plant feeders, many of which are of considerable economic importance. They are part of the Scarab beetles (Scarabaeidae), a very large family of beetles with more than 30,000 known species around the world.

You've probably been aware of white grubs feeding on the roots of your lawn, as well as on potatoes and carrots in your garden. They cut the main stems or roots of plants below the soil surface and also tunnel into tubers and freshly rooted plants. They are one of the most difficult lawn pests to deal with.

The grubs are white or yellowish and have fleshy, wrinkled C-shaped bodies, with tan or brown heads and 6 spiny legs. They are quite small upon hatching, but at maturity can measure from 2 to 4 cm (¾ to 1½ inches) long, depending on the species.

The most common white grubs you'll find infesting your turf in Canada are those of the native June beetle or Junebug. About twenty species live in Canada; all of them are very similar and difficult to distinguish from each other. Two other smaller exotic species, the European chafer and the Japanese beetle, have been accidently introduced into Canada and occur mainly in southern Ontario, primarily in the Niagara peninsula. The European chafer, however, has recently migrated further north and east, and is responsible for much of the lawn damage in recent years in eastern Ontario. Usually the cold helps to control these pests, but the milder winters lately are partly to blame for an increase in their populations.

Life Cycles

The June beetle differs from the European chafer and the Japanese beetle in having a 3-year life cycle, while the other two have annual life cycles. The adults do eat some plants, but it is the grubs that do the greatest damage, particularly when they are at a specific larval stage (2nd and 3rd instars). The different life cycles are depicted in the following chart and are described below. The cross-hatched areas in the table represent the stages when the grubs do the most damage.

June Beetles

June beetle adults are shiny reddish brown and can be up to 2.5 cm (1 inch) long and feed on the leaves of many trees and shrubs. The females deposit their pearly white eggs in balls of earth held together with a sticky secretion, 5–10 cm (2–4 inches) deep in the soil. The young grubs hatch 2–3 weeks later. For the first summer, the grubs feed mostly on decaying vegetation in the soil. In fall, they burrow deep into the soil to overwinter. The following spring, the grubs return to the top of the soil to do the most damage by feeding ravenously on roots. They hibernate once again for the second fall, and return the following spring. They feed until June, and form an earthen cell where they pupate. The adults emerge from the pupae within a month, but remain in the ground until the following spring.

They then leave their earthen cells during the latter part of May to early June. The beetles take to the air at dusk and feed and mate on foliage. During the day, they seek out grassy or weedy areas and burrow into the soil where the females lay their eggs.

The June beetle most commonly has a 3-year life cycle. In the past, outbreaks of white grubs have occurred every 3rd year.

Table of Life Cycles

Insect		Month											
		J	F	M	A	M	J	J	A	S	O	N	D
June beetle	Year 1												
	Year 2												
	Year 3												
European chafer													
Japanese beetle													

European Chafer

The adult is light brown or tan and is about 1.3 cm (0.5 inch) long. Adults emerge from the soil in mid to late June and swarm into trees and bushes at sunset, making a loud buzzing sound. They do very little feeding, instead using the flights at dusk to mate on the warm June or July evenings. The females return to the turf grass areas and deposit their eggs below the soil, generally 20–30 eggs at a time, each in its own cell.

The grubs emerge within 2 weeks and commence feeding. The grubs are close to mature size by the end of September and begin to seriously damage the turf. These grubs have a great tolerance to the cold (they can withstand freezing), which allows them to remain active until late November. As soon as the frost has disappeared in the spring, activity resumes. By mid-May, they cease feeding and pupate. The adults emerge 2 weeks later. The European chafer has an annual life cycle.

Japanese Beetle

The adult beetle is metallic green and bronze, about 1 cm (less than 0.5 inch) long. The adults emerge in early July and are present for 30–45 days. They are most active on warm sunny days, when they congregate on a variety of plants. The Japanese beetle will feed on leaves and any available ripe fruits. They will often skeletonize leaves and feed in a mass on the ripening fruit. During this time, females will periodically go to one location and deposit some eggs 3–5 cm (1–2 inches) below the soil surface.

The grubs hatch in 2 weeks and feed on the plant roots in the upper 10 cm (4 inches) of soil. The grubs will begin to migrate below the frost line by mid to late October, and do not return until late April or May of the following year. This species is more sensitive to the cold than the European chafer. The grub will then pupate in late spring or early summer. The adult emerges 2 weeks later. The Japanese beetle has an annual life cycle.

Signs Of Grub Infestation

1. The grubs feed on the roots of many plants but prefer the fibrous roots of your lawn grass. As the roots are destroyed, your turf will wilt and turn brown. As you walk across your lawn, the affected areas will feel soft and spongy. These spots can be lifted up with ease. Carefully fold back the turf and observe the number of grubs exposed. Damage is often the most severe in the spring and fall when moisture levels in the soil are high. During drier periods, the eggs may be killed and you would find surviving larvae deeper in the soil. Extremely dry summers destroy many eggs and newly hatched grubs. You can find mature grubs near the surface in late summer and early fall.

2. Often skunks and other small mammals will pull back the turf in search of grubs in the spring or fall. This secondary damage to your lawn, as well as flocks of starlings and blackbirds feeding on the lawn, are clues to grub infestation. If you have any of these natural predators digging at your grass, check for white grubs. Many people notice this indicator first.

Integrated Pest Management

Integrated pest management or IPM is a process for planning and managing sites to prevent pest problems and for making decisions about when and how to intervene when pest problems occur. A key idea in IPM is that it is necessary to take action against pests only when their numbers warrant it, not as a routine measure. In most cases it is only necessary to suppress pest populations to non-damaging levels, not to eliminate them. In an IPM program, pest managers use regular inspections, called monitoring, to collect the information needed to decide whether or not action must be taken. If treatment is warranted, pest managers choose the most appropriate combination of control measures for the site.

You can use these principles in controlling pests around your yard and home, including white grubs.

Physical Control

Cultural practices are the best way to ensure the health of your plants before any problems occur.

1. A fall lawn and garden cleanup will help reduce the number of grubs that overwinter in your yard. Remove old plants and weeds, rake your lawn to remove excessive thatch, and cultivate the soil thoroughly to expose any grubs to their predators and weather.

2. Healthy, vigorously growing lawns can tolerate more grub feeding than stressed lawns without showing damage because they generally have extensive root systems, so damage to one root is compensated for by others. These lawns also have adequate leaf tissue for photosynthesis to provide nutrients and energy to repair the root damage. Ensure the proper drainage of your lawn and flow of water and nutrients between the grass and soil by removing excessive thatch and aerating compacted soil areas. The use of a mechanized soil aerator with spikes in place of plugs or spiked sandals can help to kill some grubs. These are available from home and garden stores.

3. Beetles prefer to lay eggs in closely cropped lawns, so raise your summer mowing height to 6–8 cm (2.5–3 inches). This will also protect the soil surface from

BEC-3228